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7.4 Determination of TTCS volume,

confirmation of gas espación 2nd check (quick)

			TTCS volume determination	etermination				
	Date: 28/16/2019	Company:	any: 575υ.	Locat	tion: CERN ·		Engineer:SXh	33
Step No.	Action	Action and Description	,	Monitoring	Value	Result	Comment	Time
22.	Take by hand environment conditions	tions						
23.	Temperature: Humidity:	y: Pressure:	ure:					
	□ 21 °C. %RH		MPa		2			
24.	Affix any two of the three PT1000s on the side surface of the SV1.5.	000s on the side surface	e of the SV1.5.					1
	and leave the rest one to monitor environmental temperature	or environmental tempe	erature.			×		05:1
25.	Connect the SV1.5 (any of the three stand vessels can be used) to	the three stand vessels	s can be used) to					,
	connector 3;							
	Note: Longer extend tube may be used and height difference may exist	be used and height di	ifference may exist					
	between the SV1.5 and connector 3.	tor 3.				•		<u>い</u> き
	Note: The extend tube between connectors and valves must be	ween connectors and	d valves must be			10		15.1
	supported to reduce strain.							
	(For the new connectors, wrench screw nuts with one and quarter	ench screw nuts with	h one and quarter					
	circles. For the used connectors, wrench the screw nuts further tightly.)	s, wrench the screw nut	ts further tightly.)					
26.	Connect the N ₂ bottle to connector 2;	ctor 2;				40		1001

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		TTOS volumo	datamination				
			מפופוווווומנוסוו				
	Date:	Company:	Local	tion:		Engineer:	
Step No.	Action	Action and Description	Monitoring	Value	Result	Comment	Time
27.	Connect a dry mechanical pump to vacuum connector	p to vacuum connector			10		7.5
28.	Connect the TTCS loop to connector 1;	nector 1;			,		
	Longer extend tubes may be	Longer extend tubes may be used and height difference may exist			> 		J
	between the TTCS loop and connector 1.	nnector 1.			7		130.
	Note: The extend tube betwee	Note: The extend tube between connectors and valves must be					
	supported to reduce strain.						
29.	Close valve 1, valve 4 and the	Close valve 1, valve 4 and the N ₂ bottle valve, open valve 2, valve 3, the	Evacuate Time	1~2 hours			, , ,
	SV1.5 valve, pressure regulato	SV1.5 valve, pressure regulator and the vacuum valve slowly, pump the	Vacuum gauge		270		0.00
	SV1.5 and the filling box down to 30Pa;	1 to 30Pa;	reading	≤30Pa	Jula.		
30.	Close the vacuum valve open the valve of the N_2 bottle	he valve of the N ₂ bottle					
31.	Fill the SV1.5 with N ₂ up to 4	Fill the SV1.5 with N ₂ up to 4.5MPa, then close valve 2; waiting until	Evacuate Time	0.5~1hours			:
	pressure and temperature of th	pressure and temperature of the standard vessel is stable. Take by hand	P1		5.305M/2	ر	5/5
	the pressure as P1.		No.1 Pt1000	T _{room} ±1°C	23.801~2	7.81	
	Take by hand the average rea	Take by hand the average reading of the three PT1000s in the filling	No.2 Pt1000 No.3 Pt1000	T _{room} ±1°C	23.50	•	
	system as T ₁ .			T _{room} ±1°C	2) Sol ~ 2) Sol Cypan, temperature)	3º/ Croa	m, temper
	(here T_1 is comparable to T_{room} with range of $\pm 1^{\circ}$ C);	with range of ±1°C);			11.000	0	_
		1 1 1 1 1	-	,			

CYEMANK: the SIPS abread filled Awith Nz, So just vacuum the extend tube)

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Date:		Company:	Location:	tion:	ম	marinaan.	
T T					,	вившеет:	
Step No.	Action	Action and Description	Monitoring	Value	Result	Comment	Time
32. Close the fill	lled SV1.5 valve, va	Close the filled SV1.5 valve, valve 3, and the N ₂ bottle valve, disconnect)				Filled
the filled SV	the filled SV1.5 from connector 3;	<u></u>	1 lags	During	land lis	annot th	1
33. Weight the f	filled SV1.5 with an	Weight the filled SV1.5 with an electronic balance (0.1g precision or	1 Low co	mount, 4 would	Juni Can	7000	20023
better), as Mnitrogen1;	Initrogen1;			_			
34. Connect the	Connect the filled SV1.5 back to the connector 3;	o the connector 3;)				
35. Open valve	3, valve 1, vale 4 and	Open valve 3, valve 1, vale 4 and the vacuum valve; open pressure)		`
regulator to	pump the filling box	regulator to pump the filling box and TTCS loop down to 30Pa;			100/a		8:36
36. Close the va	acuum valve, valve l	Close the vacuum valve, valve 1 and valve 4, switch off the pump.	DPS reading of the	≤0.5Bar	` `		
Open the SV	V1.5 valve and close	Open the SV1.5 valve and close SV1.5 valve, slowly open valve 1 to fill	TTCS loop		<0.50mm		
the N ₂ into	the TTCS loop to	the N ₂ into the TTCS loop to prevent pressure spike to the sensors.			part.		
Repeating o	n and off the SV1.5	Repeating on and off the SV1.5 valve and valve 1 in turn until pressure		c			
of the TTCS	S loop is up 1.5MP:	of the TTCS loop is up 1.5MPa, and then slowly open the SV1.5 valve					
and valve.							

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0.00/	-1.48/1-0.0011	l	2.645 Mm	,			
			6735MPa. 14876		Determine the fill mass by $\mathbf{M}_{C_L} = V_{Loop} FR$ (where $FR = 569.60$ g/l).	Determine the fill mass by N	43.
			14	_	m _{nitrogen} = 28g/mol for nitrogen, and R is the gas constant;	m _{nitrogen} = 28g/mol for nitroge	
	13	Vora-VI	7.7.	Vhoop =		$V_{Loop} = \frac{M_{ m nitrogen}RT_2}{m_{ m nitrogen}P_2} - V_{FT}$	
)		0.7		The volume of the loop is determined by the ideal gas equation, where	The volume of the loop is de	42.
					m2 ₃	Mnitrogen= Mnitrogen1 -Mnitrogen2:	
					The nitrogen mass inside the loop and the filling system is:	The nitrogen mass inside the	41.
					Weight the SV1.5 with the electronic balance again, as M _{nitrogen2} ;	Weight the SV1.5 with the e	40.
					connector 3;	Disconnect SV1.5 from the connector 3;	39.
					5 valve and the TTCS valve;	Close valve 1, valve 3, SV1.5 valve and the TTCS valve;	38.
25		22.9%	T _{room} ±1°C				
228	Toulor = 21.882 -22.58	21.30					
2 ~ 266	17708 = 23.440 25.44°C		T _{room} ±1°C	No.1 Pt1000	_{nom} with range of ±1°C);	(here T ₂ is comparable to T _{room} with range of ±1°C);	
0:50		10,00			and the average reading of the three PT1000s in the filling system as T_2 .	and the average reading of the	
0 1		2/U/M		P2	Wait a period of time (0.5 \sim 1hours), take by hand the loop pressure as P2	Wait a period of time (0.5~1	37.
Time	Comment	Result	Value	Monitoring	Action and Description	Act	Step No.
	Engineer:		Location:	Loc	Company:	Date:	
				determination	TTCS volume determination		

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and check P-loop

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		TTCS volume determination	determination				
	Date:	Company:	Toc.	Location:	A.	Engineer:	
Step No.	Actio	Action and Description	Monitoring	Value	Result	Comment	Time
44.	Calculate the filled mass for the standard vessel	ne standard vessel	16.				
	Set $M_{C_VS} = M_{E_VS} + M_{C_L} + M_{C_R}$;	M _{C_R} ;					
	NOTE:			83 154			
	$M_{C_R} = M_{C_{R_VS}} + M_{C_{R_FT}} = V$	$\mathbf{M}_{C_{.}R} = \mathbf{M}_{C_{.}R_{.}VS} + \mathbf{M}_{C_{.}R_{.}FT} = V_{VS} \times \rho_{G}(T, P) + V_{FT} \times \rho_{G}(T, P)$					
	Here ρ_G (T, P) is determine	Here ρ_G (T, P) is determined by the chosen final temperature of the					
	standard vessel and the final s	standard vessel and the final saturated pressure of the TTCS loop.				81	
45.	Repeat the above procedure	Repeat the above procedure of TTCS volume determination again for					
	confirmation						

7.5 Fill a standard vessel with CO₂ from a Gas bottle

2.	1. T	Step No.		
l'emperature:	Take by hand environment conditions		Date:	
%RH	ent conditions	Action and Description		
	1	escription	Cor	Fill
Pressure:			Company:	a standard ves
MPa				sel with (
		Monitoring	Loc:	Fill a standard vessel with CO ₂ from a Gas bottle
		Value	Location:	bottle
		Result		
		Comment	Engineer:	
		Time		

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